Fourth Five-Year Review Report
for
Hercules 009 Landfill
GAD980556906

Brunswick
Glynn County, Georgia

September 2016

United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by:

Franklin E. Hill, Director
Superfund Division

Date: 9/6/16

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Tables

Figures

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
BHC	Alpha-Benzene Hexachloride
BTEX	benzene, toluene, ethylbenzene and xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
ft bgs	feet below ground surface
FYR	Five-Year Review
GAEPD	Georgia Environmental Protection Division
GEC	Glynn Environmental Coalition
IROD	Interim Record of Decision
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
ppt	parts per trillion
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
TCE	Trichloroethylene
TEF	Toxicity Equivalence Factor
TEQ	Total dioxin equivalent concentrations
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
µg/kg	microgram per kilogram
µg/L	microgram per liter

Executive Summary

The 16.5-acre Hercules 009 Landfill Superfund site (the Site) is located in Brunswick, Glynn County, Georgia. Beginning in 1948, Hercules Incorporated. (Hercules) manufactured toxaphene, an agricultural pesticide used to control boll weevils, as well as ticks and mites on cattle. Starting in 1975, Hercules used 7 acres at the northern end of the Site, known as the 009 Landfill, to dispose of wastewater sludge generated from the toxaphene manufacturing processes at its Brunswick facility, about 4 miles away. Site manufacture of toxaphene ceased in December of 1980 and in 1982, the United States Environmental Protection Agency banned the use of toxaphene.

The United States Environmental Protection Agency (EPA) added the Site to the Superfund program's National Priorities List (NPL) in September 1984. The 1991 Interim Record of Decision (IROD) for Operable Unit (OU) 2 addressed potential groundwater contamination at local private wells. Although contaminant levels found in private wells did not exceed the drinking water standards, area residents were connected to the municipal water supply to mitigate the potential future risk to human health. The 1993 Record of Decision (ROD) for OU1 of the Site addressed source areas at the Site, including the landfilled sludge, soils, sediment, surface water and contaminated groundwater. OU1's remedy consisted of monitored natural attenuation; long-term groundwater monitoring; a contingent groundwater pump-and-treat system; in-situ stabilization of contaminated soils; treatment of contaminated sludge and soil; an on-site monolith; and institutional controls to restrict land use, preclude any extensive excavation of the Site, and restrict groundwater use until cleanup goals are met.

The Site's potentially responsible party (PRP), Hercules, conducted the remedial actions. The Site reached construction completion on September 24, 1999. The triggering action for this five-year review (FYR) was the signing of the previous FYR on July 6, 2011.

The remedy for OU1 currently protects human health and the environment because contaminated source material and soil contamination have been excavated, stabilized and contained on the Site within a monolith, and there are no current exposures to contaminated groundwater. In order for the OU1 remedy to be protective in the long term, institutional controls should be implemented, data downgradient of monitoring well N-5 should be collected and assessed.

The interim remedy for OU2 is protective of human health and the environment because municipal water lines from the Brunswick water system were extended to well users in the area and samples from monitoring wells upgradient of the residential area meet the Safe Drinking Water Act Standards.

Because the remedial actions at all OUs are protective in the short term, the Site's remedy is protective of human health and the environment in the short term. In order for the remedy to be protective in the long term, institutional controls should be implemented, data downgradient of monitoring well N-5 should be collected and assessed.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Hercules 009 Landfill		
EPA ID: GAD980556906		
Region: 4	**State:** GA	**City/County:** Brunswick/Glynn
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Scott Martin (EPA) and Sarah Alfano and Treat Suomi (Skeo Solutions)		
Author affiliation: EPA and Skeo Solutions		
Review period: July 2015 – July 2016		
Date of site inspection: October 29, 2015		
Type of review: Statutory		
Review number: 4		
Triggering action date: 07/06/2011		
Due date *(five years after triggering action date)*: 07/06/2016		

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU2

Issues and Recommendations Identified in the Five-Year Review:				
OU1	**Issue Category: Remedy Performance**			
	Issue: Benzene levels continue to exceed Maximum Contaminant Levels (MCLs) at monitoring well N-5.			
	Recommendation: Collect data downgradient of N-5 to refine the extent of groundwater contamination.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	1/31/2017

OU1	**Issue Category: Institutional Controls**			
	Issue: Institutional controls to restrict land use and groundwater use until cleanup levels are achieved are not in place.			
	Recommendation: Site stakeholders should finalize and implement institutional controls that restrict land use and groundwater use until cleanup goals are met.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	1/31/2017

Protectiveness Statements

Operable Unit: 1	*Protectiveness Determination:* Short-Term Protective
Protectiveness Statement: *The remedy for OU1 currently protects human health and the environment because contaminated source material and soil contamination have been excavated, stabilized and contained on the Site within a monolith, and there are no current exposures to contaminated groundwater. In order for the OU1 remedy to be protective in the long*	

term, institutional controls should be implemented, data downgradient of monitoring well N-5 should be collected and assessed.

Operable Unit: 2	*Protectiveness Determination:* Protective

Protectiveness Statement:
The interim remedy for OU2 is protective of human health and the environment because municipal water lines from the Brunswick water system were extended to well users in the area and samples from monitoring wells upgradient of the residential area meet the Safe Drinking Water Act Standards.

Sitewide Protectiveness Statement

Protectiveness Determination:
Short-Term Protective

Protectiveness Statement:

Because the remedial actions at all OUs are protective in the short term, the Site's remedy is protective of human health and the environment in the short term. In order for the remedy to be protective in the long term, institutional controls should be implemented, data downgradient of monitoring well N-5 should be collected and assessed.

Five-Year Review Summary Form (continued)

Environmental Indicators
- *Current human exposures at the Site are under control.* - *Current groundwater migration is under control.*

Are Necessary Institutional Controls in Place?
☐ All ☐ Some ☒ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No

Has the Site Been Put into Reuse?
☒ Yes ☐ No

Fourth Five-Year Review Report
for
Hercules 009 Landfill Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

Skeo Solutions, an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Hercules 009 Landfill Superfund site (the Site) in Brunswick, Glynn County, Georgia. The EPA's contractor conducted this FYR from July 2015 to July 2016. The EPA is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. The Georgia Environmental Protection Division (GAEPD), as the support agency representing the State of Georgia, has reviewed all supporting documentation and provided input to the EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of two operable units (OUs). This FYR report addresses both site OUs.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
GAEPD issued permit for the Site and Hercules began operations	1974
State inspectors discovered contamination	November 1, 1979
GAEPD revoked the permit and Hercules stopped disposal and closed the landfill	1980
EPA conducted a site inspection, the EPA and State conducted a preliminary assessment	January 1, 1980
EPA proposed the Site for listing on the National Priorities List (NPL)	September 8, 1983
EPA listed the Site on the NPL	September 21, 1984
PRP initiated the remedial investigation/feasibility study (RI/FS) for OU1 and OU2	July 15, 1988
PRP completed the RI/FS for OU2, the EPA issued an Interim Record of Decision (IROD) for groundwater (OU2)	June 27, 1991
PRP initiated remedial design for OU2	November 1, 1991
PRP completed remedial design for OU2, PRP began remedial action for interim groundwater remedy	January 7, 1992
Hercules Incorporated. (Hercules) extended municipal water lines along Benedict Road and Nix Lane	December 1992
PRP completed remedial action for OU2 and submitted remedial action report for OU2; PRP began operation and maintenance (O&M) for OU2	March 3, 1993
PRP completed the RI/FS for OU1; the EPA signed the ROD for OU1	March 25, 1993
PRP initiated remedial design for OU1	October 7,1993
PRP initiated off-site and residential soil excavation	October 1994
PRP completed off-site and residential soil excavation	July 1995
PRP completed remedial design for OU1, PRP began stabilization remedial action for soils and sediment	March 2, 1998
EPA issued an Explanation of Significant Differences (ESD) for OU1	August 14, 1998
EPA completed the first FYR for OU2	September 21, 1998
PRP completed stabilization remedial action for OU1	March 30, 1999
PRP initiated O&M for OU1	June 30, 1999
EPA prepared the Preliminary Close-Out Report	September 24, 1999
EPA completed the second FYR	June 13, 2006
Hercules initiated a groundwater assessment to determine extent of benzene plume	September 8, 2010
EPA completed the third FYR	July 6, 2011

3.0 Background

3.1 Physical Characteristics

The approximately 16.5-acre Site is located in a commercial and residential area, in an eastern portion of Glynn County, Brunswick, Georgia, approximately 2 miles south of Interstate 95 (see Figure 1). The landfill is approximately 1 mile west of coastal wetlands, within the Atlantic Coastal Plain province of Georgia.

Groundwater in the shallow zone of the surficial water-bearing unit flows toward the east. Groundwater in the deep surficial aquifer flows toward the southeast (see Appendix F). There is a pond at the southern

end of the Site that receives runoff only from the immediate area surrounding the pond, and has no permanent surface inflow or outflow.

Surface sediments on the Site are less than 150 feet in depth and consist of layers of sands, gravels and clays. Beneath the surficial layer is a 400-ft thick layer of Miocene sediments, which are represented by the Hawthorne formation. These sediments serve as a confining layer between the surficial water-bearing unit and the deeper Floridan aquifer. The Floridan aquifer, at an approximate depth of 500 feet, is the primary aquifer in the area for large irrigation and municipal supplies; residential wells in the area generally tap the surficial aquifer. The original discovery threatened only the surficial aquifer, and due to the thick confining layer separating the two aquifers, only the surficial aquifer is monitored.

3.2 Land and Resource Use

The Site is surrounded by an automobile dealership to the north; Golden Isles Parkway to the west; a juvenile slash pine forest on the east; and several homes, a church, a school, and a strip shopping center to the south/southeast of the property. Land use in the area is predominantly commercial and residential. The Site includes several fields, a vegetated monolith and a pond at the southern tip of the property. The adjacent automobile dealership worked with Hercules Incorporated. (Hercules) and the EPA to put a portion of the Site back to safe and productive use by paving the top and installing runoff retention ponds. The dealership fenced and paved the top of the monolith and is reusing it as a parking lot to display cars. This reuse has helped to further preserve the integrity of the monolith beneath the paved cap. Over the past few years, Hercules began working with the Wildlife Habitat Council to obtain a Conservation Certification for the on-site pond. The company installed wildlife cameras to document wildlife, positioned basking logs, and added cover boards to attract insects and reptiles.

Historical disposal practices at the Site resulted in soil, surface water and groundwater contamination. The 1991 OU2 Interim Record of Decision (IROD) called for surrounding properties to be connected to municipal water. With the homeowners' permission, remedial workers connected all the impacted residences and a local church to the municipal water system for potable water by 1992. A remedial action report was submitted to EPA in 1993. Residents in the area no longer use their private wells as a potable water source though some use their well water for outdoor purposes.

3.3 History of Contamination

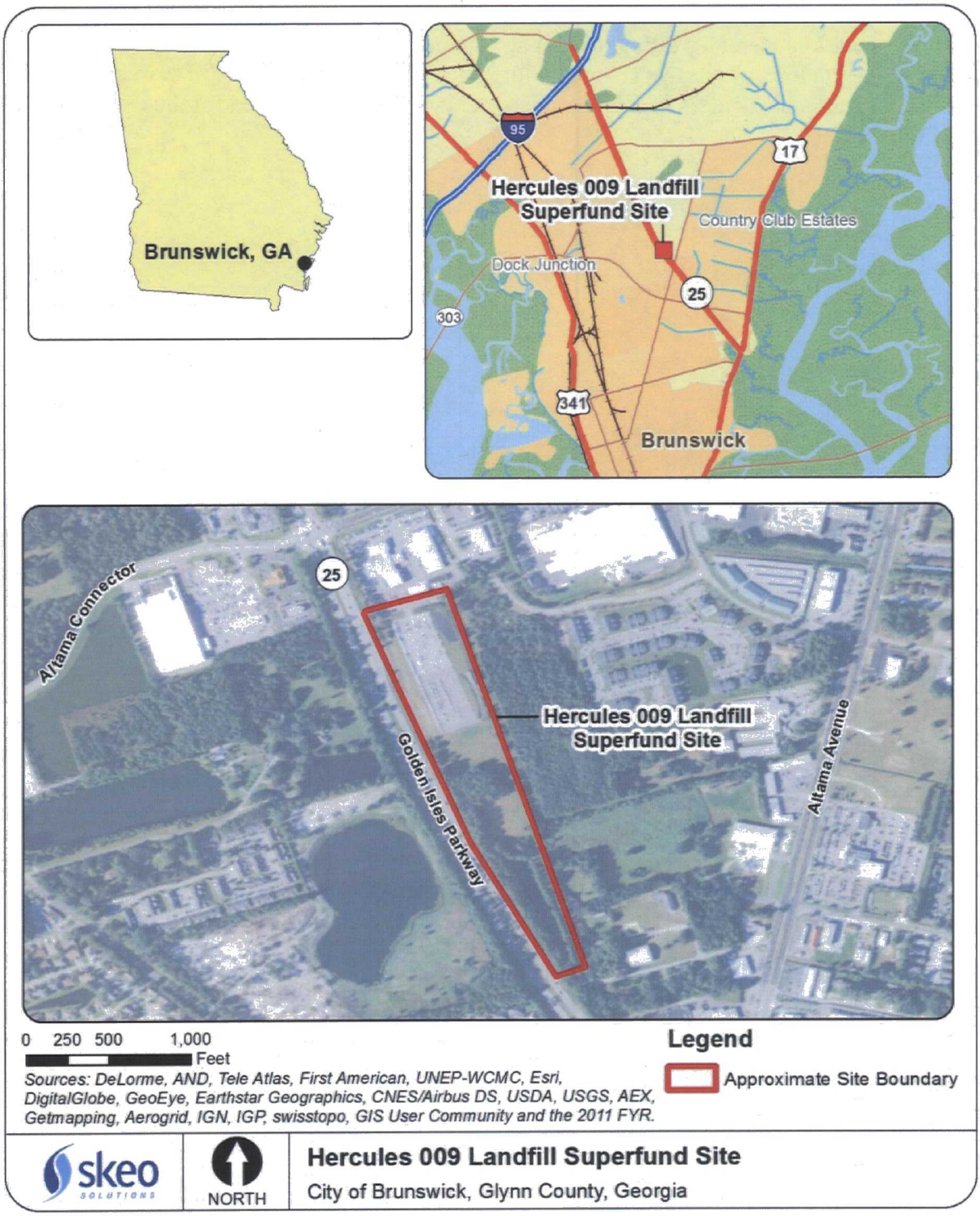
Beginning in 1948 Hercules manufactured toxaphene at its manufacturing facility located about 3 miles from the Site. In 1974, GAEPD issued Hercules a permit to use 7 acres at the northern end of the Site, known as the 009 Landfill, for disposal of wastewater sludges generated from the toxaphene manufacturing process. Hercules constructed the 009 Landfill as six lined cells (see Figure 2). The thickness of the toxaphene sludge disposed of in these cells was reported to be 6 to 7 feet. Typically, Hercules disposed of wastewater sludge directly in the landfill; however, occasionally they staged it near the southeast corner of the landfill prior to disposal.

The sludge deposited in the landfill consisted of very fine calcareous particulate, diatomaceous earths and finely crushed limestone material. Toxaphene adsorbed to this material during neutralization of the byproduct hydrochloric acid. Trucks transported the sludge to the landfill in bulk. Trucks hauling material to the landfill reportedly entered through an entrance off of Benedict Road, which is now named Granville Nix Lane, located on the southern side of the Site. Remedial crews used a second

entrance to the Site, located along Spur 25 (on the western side). In addition to the sludge, used toxaphene-product drums, toxaphene-contaminated glassware, rubble and trash filled the landfill.

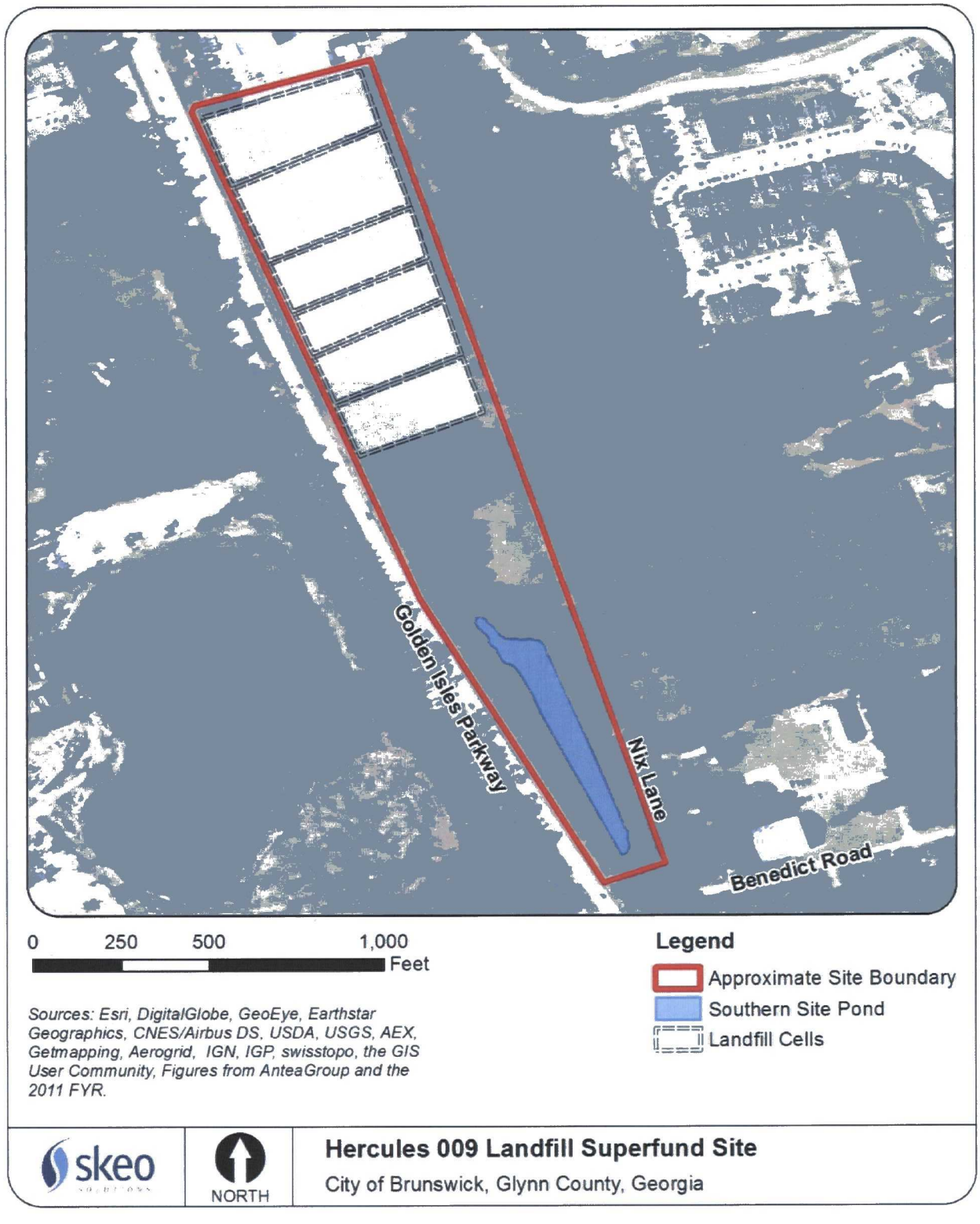
During its years of operation, Hercules estimated that approximately 33,000 cubic yards of sludge had been disposed of in the landfill, which was covered with 24 to 30 inches of "stump dirt" mixed with boiler ash. The term "stump dirt" refers to soil entrained on pine stumps purchased for the extraction of resins and essential oils.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure 2: Site Details Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

3.4 Initial Response

In March 1980, the GAEPD collected soil and water samples from drainage ditches around the Site as part of a state investigation. The samples revealed toxaphene in both soil and water samples indicating that some component of the containment system in place allowed for migration.

As a result of finding contamination in soil and water samples, the GAEPD canceled Hercules' disposal permit and waste disposal ceased. The GAEPD ordered the landfill be closed in accordance with the approved state closure plan. Hercules closed the landfill and in 1982, the EPA banned the use and manufacture of toxaphene. Prior to the ban, manufacture of toxaphene at the site had ended in December 1980. The EPA proposed the Site to the Superfund program's National Priorities List (NPL) in September 1983 and finalized the Site on the NPL in September 1984.

3.5 Basis for Taking Action

The EPA entered into an Administrative Order on Consent (AOC) with Hercules in July 1988 for Hercules to perform the remedial investigation/feasibility study (RI/FS). During the RI, the EPA discovered toxaphene contamination in the groundwater. Residents located on Benedict Road and Nix Lane near the Site used groundwater for their drinking water source. Due to the length of time that would be required to complete the RI/FS and the immediate nature of the threat posed by potentially-contaminated groundwater to nearby residents, the EPA moved ahead with an interim action for OU2 (discussed below) in 1991. This interim action required that local residences and a nearby church be provided an alternate supply of water.

In early 1993, Hercules conducted an RI/FS for site soils and contaminated groundwater. Results from the study found that toxaphene concentrations in the soils surrounding the landfilled sludge ranged from below the detection limit to 4,900,000 micrograms per kg (µg/kg). The EPA has classified toxaphene as a probable human carcinogen. The study found concentrations of toxaphene were generally highest in the vicinity of the landfill cells and decreased with distance from the cells. An exception was the historic staging area (area where sludge was unloaded) near the southern site entrance. The study also detected toxaphene in landfilled sludge samples at concentrations ranging from 850,000 to 15,000,000 µg/kg.

During the RI, toxaphene was not detected in any surface water samples in the on-site pond or drainage ditch. However, toxaphene was detected at a maximum of 860 µg/kg in two sediment samples adjacent to the Site. Investigations indicated that site contamination had not adversely affected the tested animal communities within the drainage ditch or the estuary.

The biological assessments conducted during the RI/FS indicated that the Site has not adversely affected the tested animal communities within the drainage ditch or the estuary. The risk assessment indicated that wildlife using the on-site pond, adjacent drainage ditch, or downstream estuary are not exposed to concentrations of constituents that result in excessive levels of risk.

The RI identified the flow of groundwater from the landfill cell area toward several private drinking water wells nearby as a potential threat. Although sampling levels found in private wells did not exceed the drinking water standards, groundwater flowed from the Site toward private wells.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

The EPA addressed the Site in two OUs, presented in this FYR in chronological order. OU2 addressed the threat of potential groundwater contamination at private residential wells. OU1 addressed the surface water, groundwater contamination and source areas at the Site.

OU2

On June 27, 1991, the EPA issued the OU2 IROD, which required connecting area residents to the municipal water supply to mitigate the potential future risk to human health. The remedial action objective (RAO) established in the 1991 interim action ROD was:

- To protect people from exposure to toxaphene and other possible contamination in the surficial aquifer.

The EPA designed the interim action RAO for the OU2 groundwater to prevent the possible future consumption of contaminated groundwater. The remedial components for OU2 included:

- Municipal water lines from the Brunswick water system should extend along Benedict Road and Nix Lane.
- All the residences and the Beverly Shores Baptist Church (now Grace Baptist Church) should be connected to the municipal water system.
- Private wells immediately downgradient of the landfill should be replaced by the municipal water system.

Because OU2 only addressed potential future contamination through an interim action, the ROD identified no contaminants of concern. The EPA planned subsequent actions through a separate OU (OU1) to fully address the principal threats posed by conditions at the Site. The 1993 OU1 ROD would

further establish that the abandonment of private wells was contingent upon the owners' approval and was not required (see below).

OU1

On March 25, 1993, the EPA issued the OU1 ROD. The purpose of the remedy was to contain contamination on site and to reduce potential risks to human health and the environment. The RAOs established in the 1993 ROD are:

- To prevent the infiltration of precipitation through wastes and affected soils and the percolation of the resulting leachate into subsurface soils and groundwater, followed by groundwater transport.
- To prevent the release of affected surface soil through surface water runoff.
- To prevent the release of affected soil through wind erosion.
- To prevent the release of volatile compounds from soils and waste to the atmosphere.

The 1993 ROD initially outlined the OU1 remedy, which was revised in the 1998 Explanation of Significant Differences (ESD). The major components of the final remedy, as determined by the 1993 ROD and updated by the 1998 ESD include:

- Conduct a treatability study to evaluate in-situ stabilization of on-site source materials, including the landfill, the staging area, the drainage ditch and contiguous soils southeast of the site.
- Delineate and remove surface soil contamination from residential areas.[1]
- Implement in-situ stabilization of subsurface soils and sludge, and consolidated surface soils.
- Treat contaminated sludge and soil until the performance standard is met (see Table 3) or the regional groundwater table is reached, whichever comes first.
- Treat the surface soils from outside the landfill in an on-site treatment unit in the landfill.
- Mix Portland cement with additional stockpiled treated soils, which contain toxaphene at a concentration consistent with the treatment standards for hazardous wastes contained in Subpart D of Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions at 40 CFR Part 268.
- Place the treated soil and cement mixture over the treated soil in the landfill area and then grade mixture to 1 to 3 feet in thickness as the cap. Establish a vegetative cover over the cap to reduce erosion.
- Long-term monitoring of groundwater, as well as surface water and sediment in the on-site pond and the adjacent drainage ditch. Specific wells may be discontinued at the discretion of the EPA after the cleanup goals (see Table 2) are met for two consecutive annual monitoring periods.
- Implement a groundwater pump-and-treat system, if the EPA believes that the groundwater contaminants will not naturally attenuate below performance standards over time.
- Operate and maintain the cover for a minimum of 30 years.
- Implement institutional controls to restrict excavation and restrict groundwater use until cleanup levels are achieved.

[1] Residential soil removal is discussed on page 67 of the 1993 ROD, in the Responsiveness Summary.

Table 2: Groundwater Contaminant of Concern (COC) Cleanup Goals

Groundwater COC[a]	ROD Cleanup Goal (µg/L)[c]
Benzene[b]	5
Toxaphene[b]	3

Notes:
[a] Nickel was originally listed as a COC in the 1993 ROD. However, during the remedial design it was determined that the groundwater no longer had to be tested for nickel, see Section 4.2 for details.
µg/L microgram per liter.
[b] These COCs are not the only contaminants at the Site; they were chosen based on toxicity, mobility and frequency of detection throughout the Site after the EPA issued the ROD in 1993. It was anticipated that other contaminants at the Site would be reduced to acceptable levels when cleanup levels were met for benzene and toxaphene.
[c] Based on the federal maximum contaminant level (MCL).

Table 3: Surface and Subsurface Soil COC Cleanup Goals

Medium	Soil COC	ROD Cleanup Goal (µg/kg)
Surface Soils*	Toxaphene	250
Subsurface Soils**	Toxaphene	76,000

Notes:
*Surface soil remediation target concentrations are based on future residential land use (i.e., unlimited exposure). Surface soils are defined as those which extend to 12 inches below surface. Remedial action target concentrations are based on a carcinogenic risk of $1x10^{-6}$ or a hazard index of 1.0.
**Subsurface soil remediation target concentrations are based on future commercial land use (i.e. limited exposure) for inorganic constituents, and are based on a carcinogenic risk of $1x10^{-4}$ or a hazard index of 1.0.
µg/kg microgram per kilogram

4.2 Remedy Implementation

OU2

Hercules connected municipal drinking water lines to the residential properties and a church east and southeast of the Hercules property in December 1992. Specifically, Hercules extended water lines along Benedict Road and Nix Lane. At that time, residents were informed of the need to cease using their wells as a potable water source; however, wells were not required to be disabled or abandoned. Hercules completed the work in December 1992. Hercules submitted a Remedial Action Report for this portion of the remedy to the EPA in January 1993.

OU1

The 1993 ROD identified the areas to be remediated as the sludge contained in the landfill cells, the soils in the sludge-staging area on the Hercules property, and impacted private residences in the Benedict Road/Nix Lane area outside the Hercules property.

Surface water and stream sediment samples were collected from various locations along the drainage ditch east of the Site and from the pond at the southern end of the Site.

The toxaphene concentrations (up to 6,200 µg/kg) in the front yards of residences near the landfill did not meet the threshold for an immediate removal action. In response to the contamination, the EPA approved an Off-Site Soils and Groundwater Investigation Workplan in April 1994 to investigate the extent of contamination outside the landfill property. The work included the collection of surface and subsurface soil samples from the residential area along Benedict Road and Nix Lane. Based on these results, Hercules prepared a work plan for excavation of affected soils in and around the residential areas. Hercules stockpiled the contaminated soil from the residential area on their property and later stabilized it with the rest of the source contamination. Hercules submitted a final report documenting these residential soil removal actions and the results of confirmatory sampling to the EPA in July 1995.

In October 1995, Hercules submitted a drainage ditch area remediation work plan to the EPA to identify the extent of soils that had been affected by toxaphene as a result of ditch-dredging activities by county maintenance teams. Hercules completed the excavation of affected surface soils (approximately 6,000 cubic yards) in June 1996.

The EPA and the GAEPD approved the remedial action work plan in January 1998. Hercules constructed the landfill cover from soils in the stockpiled area on the Site. The soils were previously excavated from the residential and drainage ditch areas which contained toxaphene at a concentration consistent with the treatment standards for hazardous wastes outlined in Subpart D of RCRA Land Disposal Restrictions at 40 CFR Part 268. Hercules placed these soils over the monolith, mixed with a minimum of 3 percent cement, and compacted them to form the stabilized cover. Remedial workers applied a layer of soil on the landfill area and planted native grasses. The site team conducted the final inspection of the remedial action at the Site on March 30, 1999.

Although the 1993 ROD designated nickel, toxaphene and benzene as candidates for continual groundwater monitoring, during the remedial design the EPA and Hercules determined that continued groundwater monitoring sampling for nickel was not necessary. The 1993 ROD indicated a nickel contamination level of 186 µg/L in the KV-3 sample, which is higher than the designated a state maximum contaminant level (MCL) of 100 µg/L. However, a groundwater investigation in June 1994 determined no monitoring for nickel was required.

Historically, the benzene concentrations at the easternmost permanent groundwater monitoring well N-5 have fluctuated above the MCL. In order to determine the eastern perimeter of the benzene plume detected at monitoring well N-5, the EPA requested that Hercules conduct additional investigations. On September 8-9, 2010, Antea Group, on behalf of Hercules, conducted groundwater assessment activities at the Site in both the shallow zone of the surficial aquifer at depths of 16 to 20 feet below ground surface (ft bgs) and in the deep zone of the surficial aquifer, up to 49 ft bgs. Sampling results revealed benzene contamination and as a result the contractors expanded the testing radius. The most recent temporary well sampling in February 2011, detected benzene in shallow surficial temporary monitoring wells TW-14S and TW-19S and in deep surficial aquifer temporary monitoring well TW-19D at concentrations exceeding the MCL. Hercules provided a sampling report and recommended installing permanent confirmatory monitoring wells to the east of N-5. Hercules pursued obtaining access from the owner for permanent wells and was unsuccessful in this effort. No additional permanent wells have been installed to date.

The 1993 ROD also required institutional controls for the monolith and site groundwater; see Section 6.3 for the status of the Site's institutional controls. Institutional controls have been drafted but have not yet been finalized or recorded.

4.3 Operation and Maintenance (O&M)

Hercules began site O&M activities in 1999 following the completed construction of the landfill and the installation of the monitoring wells. Hercules sampled the monitoring wells annually since 1995; seven monitoring wells remain in operation. O&M activities related to the maintenance of routinely sampled monitoring wells include general well repair and keeping wells locked and functioning. The 1998 O&M plan requires monitoring wells to be sampled annually and repaired on an "as needed" basis.

The monolith cover requires occasional restorative maintenance. O&M activities for the monolith include maintaining the cover and perimeter fencing through inspections and repair. The slopes of the monolith are mowed regularly and the top is covered with pavement and used as the automobile dealership parking lot. The top of the monolith is kept clean and is free from cracks. Although this reuse is protective of the remedy, the current O&M plan has not been updated to reflect the monolith's updated status as a parking lot. At the time of this review, Hercules' contractor, Antea Group, provides on-site O&M services. Antea Group inspects the Site monthly.

Antea Group provides groundwater sampling activities and analytical work. The contractor performs services as specified in the EPA-approved O&M Plan April 1997 and the Remedial Action Performance Standards Verification Plan of January 1998. Hercules compiles results annually and presents them in a monitoring and inspection report. During these reporting periods, Antea Group also performs additional physical inspections and takes photographic documentation of the landfill cover.

The PRP continues to implement O&M activities outlined in the 1993 ROD. The 1993 ROD estimated the yearly monitoring costs to be $104,000, however costs listed below are in line with what is expected given current, approved on-site maintenance needs. The higher costs listed in 2011 and 2012 are due to temporary well installation and sampling.

Table 4: Annual O&M Costs

Date Range	Total Cost *(rounded to the nearest $1,000)*
2011	$172,000
2012	$60,000
2013	$37,000
2014	$19,000
2015	$13,000

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2011 FYR for the Site stated the following:

The remedy for OU1 is protective because contaminated source material and soil contamination have been excavated, stabilized and contained on the Site within a monolith, and groundwater monitoring wells continue to show natural attenuation of contaminants of concern. In order for the remedy for OU1 to be protective in the long term, institutional controls should be implemented.

The interim remedy for OU2 is protective because municipal water lines from the Brunswick water system were extended to private wells in the area and samples from monitoring wells upgradient of the residential area meet the Safe Drinking Water Act Standards.

Because the remedial actions at all OUs are protective in the short term, the Site's remedy is protective of human health and the environment in the short term. In order for the remedy to be protective in the long term, institutional controls should be implemented.

The 2011 FYR included one issue and recommendation. This report summarizes the recommendation and its current status below.

Table 5: Progress on Recommendation from the 2011 FYR

Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Implement institutional controls that restrict land use and groundwater use until cleanup goals are met.	PRP	6/13/2016	Institutional controls are in draft form but have not yet been finalized or implemented.	Ongoing

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in July 2015, and scheduled its completion for July 2016. The EPA remedial project manager (RPM) Scott Martin led the EPA site review team, which also included the EPA community involvement coordinator (CIC) Angela Miller and contractor support provided to the EPA by Skeo Solutions. In August 2015, the EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In November 2015, the EPA published a public notice in the *Brunswick News* newspaper announcing the commencement of the FYR process for the Site, providing contact information for Scott Martin and Angela Miller and inviting community participation. The press notice is available in Appendix B. One community group contacted the EPA as a result of the advertisement and the EPA site team is following up with the contact.

The EPA will make the final FYR Report available to the public. Upon completion of the FYR, the EPA will place copies of the document in the designated site repository, Brunswick/Glynn County Regional Library located at 208 Gloucester St., Brunswick, Georgia 31523.

6.3 Document Review

This FYR included a review of relevant site-related documents, including ROD, remedial action reports and recent monitoring data. Appendix A provides a complete list of the documents reviewed.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate.

- Applicable requirements are those cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location or other circumstance found at a CERCLA site.

- Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards more stringent than federal requirements may be applicable or relevant and appropriate.

- To-Be-Considered criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, To-Be-Considered criteria may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include MCLs under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Surface and Subsurface Soil

Since no federal or state contaminant-specific ARARs are promulgated for soil cleanup levels, the 1993 ROD established risk-based cleanup goals for toxaphene for surface and subsurface soils (Table 3). The validity of these cleanup goals is evaluated in Section 7.2.

Groundwater

According to the 1993 ROD and as clarified in the 1998 remedial design, two contaminants, toxaphene and benzene (see Table 6), were chosen as COCs that required remediation to reach federal MCLs based on toxicity, mobility and frequency of detection throughout the Site. This FYR compared ARARs from the 1993 ROD against the current federal and Georgia MCLs (Table 6); there were no changes.

Table 6: Previous and 2015 ARARs for Groundwater COCs

COC	1993 ROD Cleanup Goal (µg/L)	2015 ARAR (µg/L)[a]	ARAR Change
Benzene	5	5	None
Toxaphene	3	3	None

[a] Federal and Georgia MCLs are the same unless otherwise noted. Federal MCLs are available at: http://water.epa.gov/drink/contaminants/index.cfm (accessed 1/2016). Georgia MCLs for drinking water are available at: http://environet.dnr.state.ga.us/5/20130819_ProposedAmendments_DrinkingWater.pdf (accessed 1/2016).

Institutional Control Review

The Site includes two parcels (see Figure 3) 03-04607 and 03-04977. Hercules has owned both site parcels since 1974 and continually works with the EPA and the GAEPD to ensure appropriate uses. Deed information pertaining to the Site found at the Glynn County Deeds Records Office is listed in Table 7.

Table 7: Deed Documents from Glynn County Public Records Office

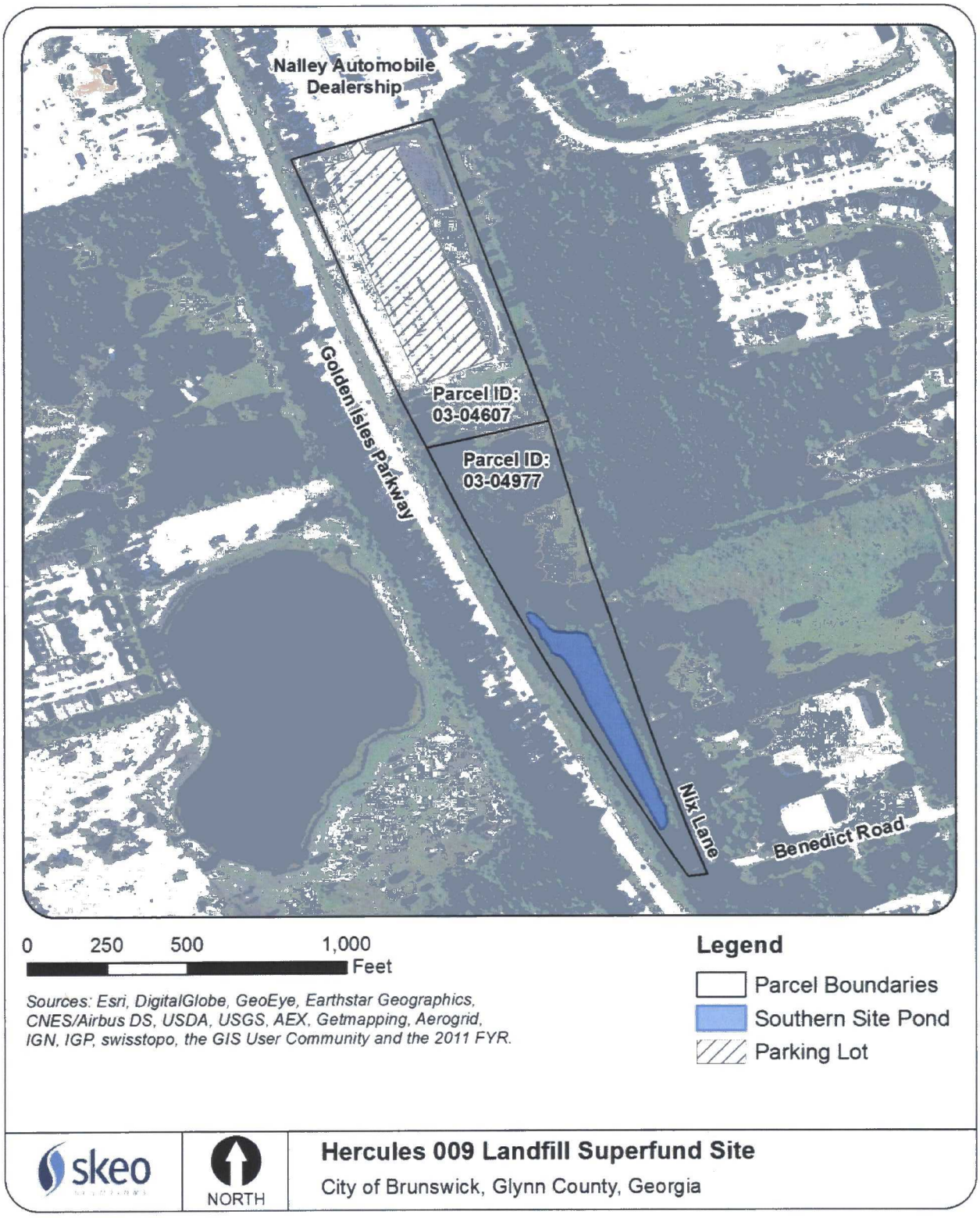
Date	Type of Document	Description	Book #	Page #
6/10/1974	Deed	Conveyance of property to Hercules Inc.	18A	990
6/10/1974	Deed	Conveyance of property to Hercules Inc.	18A	992

The 1993 ROD required institutional controls to restrict excavation and restrict groundwater use until cleanup levels are achieved; however, no institutional controls have been implemented. Institutional controls are being developed. The ROD does not prohibit building structures on the Site. Fluctuating benzene levels in N-5, particularly concentrations found in 2012 (see Table 9 and Section 6.4) could pose a vapor intrusion risk if a building were to be placed in the immediate vicinity of the well (see Section 7.2 for a risk-based screening level analysis). Table 8 lists the institutional controls needed at the Site.

Table 8: Institutional Control Summary Table

Area of Interest – OUI at Hercules 009 Landfill (Parcels: 03-04607 and 03-04977)						
Media	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Parcel(s)**	**IC Objective**	**Instrument in Place**	**Notes**
Groundwater	Yes	Yes	03-04977 and 03-04607	Restrict groundwater use until goals are met.	None	There are no current known users of surficial groundwater on or off site.
Soil	Yes	Yes	03-04977 and 03-04607	Restrict land use; preclude any extensive excavation at the Site.	None	There are no current completed routes of exposure to contaminated soil.

Figure 3: Parcel Boundary Base Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

6.4 Data Review

Soil, Sediment and Surface Water

OU1 addresses the source areas, contaminated soil on adjacent properties, groundwater and surface water at the Site. The remedial design report confirmed that the Site had not adversely affected the drainage ditch or estuary and that no further surface water or sediment sampling was required. Soils were treated using in-situ stabilization and then capped by soil meeting treatment standards. Soil remedial activities were completed in 1999. No new data for these media were available for review during this review period.

Groundwater

Seven permanent groundwater monitoring wells are sampled as part of O&M at the Site, N-5, N-6DR, N-7, N-10, N-12, N-15S and N-15D. Other wells (see Figure 5) are currently not sampled as part of the monitoring program but are still used to measure groundwater elevation, after achieving cleanup goals. As part of this FYR, sampling data were provided from 2011 through 2015.

In 2011, Hercules installed a series of temporary wells east of N-5 to better delineate the area of groundwater contamination. Groundwater at the Site flows east and southeast (see Appendix F) so the temporary well system was designed to expand out from N-5 radially in order to better define the plume (see Figure 5).

Temporary Wells

As discussed in the 2011 FYR, during the February 2011 sampling, the temporary wells confirmed that off-site groundwater has elevated concentrations of benzene in the shallow surficial aquifer and the deep surficial aquifer. These temporary wells have not been sampled since; therefore, the February 2011 results are discussed again for reference. With the 2011 sampling, contractors were able to better define the plume in the shallow surficial groundwater because the easternmost monitoring wells (in the direction of groundwater flow) were below the MCL. In the deep surficial aquifer benzene concentrations above the MCL were found in the easternmost deep surficial aquifer well, TW-19D. See Appendix H for 2011 Temporary Well Data.

Hercules has had difficulty accessing the off-site property over the last five years and has not conducted any additional rounds of temporary well sampling. Without updated sampling results for the temporary wells, it is not possible to determine the current extent of benzene concentrations in the shallow surficial aquifer or deep surficial groundwater. However, there are not any current issues with exposure as the adjacent property is not in use. Hercules has begun a pilot study to determine the effectiveness of magnesium sulfate injections on benzene levels.

Permanent Wells

Of the permanent wells sampled during this review period, only N-5 showed exceedances of benzene, see highlighted cells in Table 9 below. Although benzene levels remain above the MCL, concentrations over the past three years have decreased from 2011 and 2012. In 2012, there was a spike in the benzene

level to 710 µg/L, which is the highest concentration of benzene found in N-5 since sampling began in 1996, the second highest being in 1999 at 620 µg/L.

No monitoring wells showed exceedances of toxaphene over the past five years.

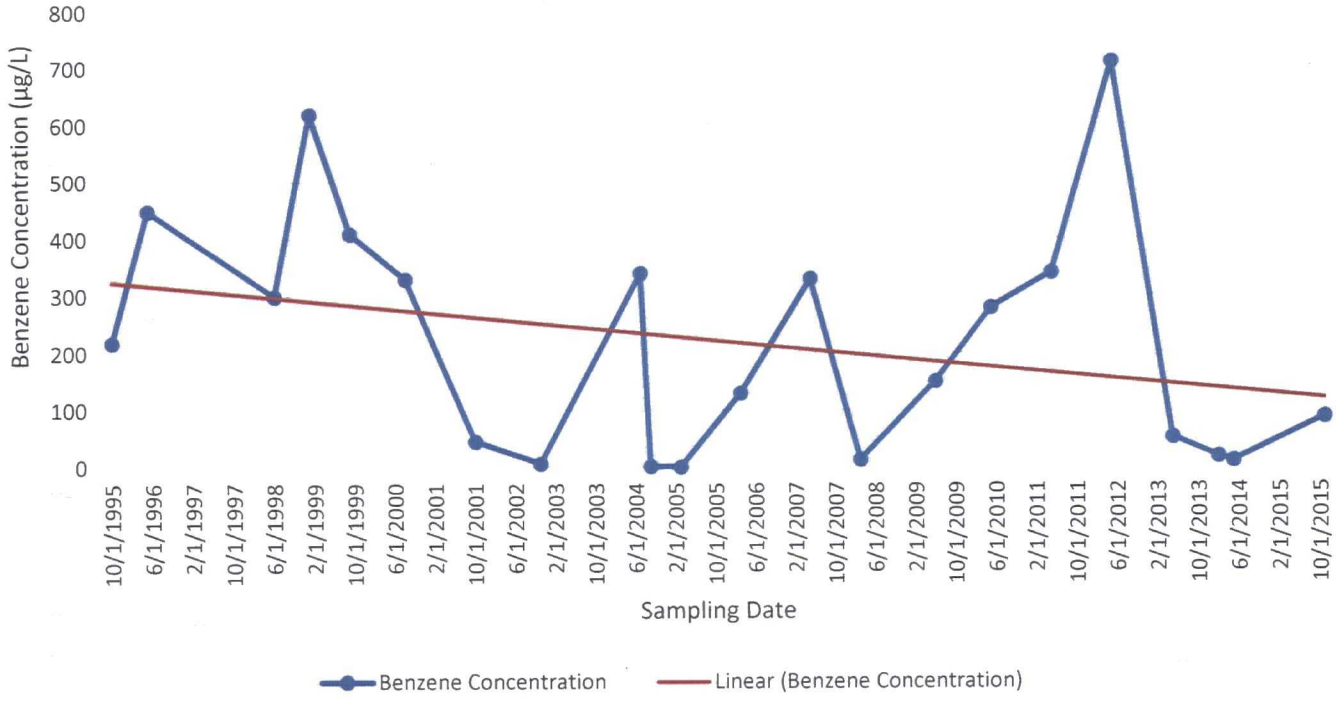
Table 9: Groundwater Sampling 2011-2015

Contaminant		Benzene	Toxaphene
MCL		5 µg/l	3 µg/l
Permanent Well ID	**Sampling Date**		
N-5	05/11/2011	340	<0.56
N-5	05/18/2012	710	<0.48
N-5	05/17/2013	51	<0.20
N-5	02/19/2014	17	NA
N-5	05/07/2014	9.2	<0.20
N-5	11/16/2015	86	<1.5
N-6DR	05/11/2011	<0.25	<0.56
N-6DR	05/18/2012	<1.0	<0.49
N-6DR	05/17/2013	<1.0	<0.20
N-6DR	05/07/2014	<1.0	<0.20
N-6DR	11/16/2015	<1.0	<1.5
N-7	05/11/2011	<0.25	<0.53
N-7	05/18/2012	0.49J	<0.48
N-7	05/17/2013	0.55J	<0.20
N-7	05/07/2014	<1.0	<0.20
N-7	11/16/2015	<1.0	<1.6
N-10	05/11/2011	<0.25	<0.55
N-10	05/18/2012	<1.0	<0.47
N-10	05/17/2013	<1.0	<0.20
N-10	05/07/2014	<1.0	<0.20
N-10	11/16/2015	<1.0	<1.6
N-12	05/11/2011	0.33J	<0.54
N-12	05/18/2012	0.32J	<0.48
N-12	05/17/2013	0.33J	<0.20
N-12	05/07/2014	<1.0	0.34J
N-12	11/16/2015	<1.0	<1.6
N-15S	05/11/2011	<0.25	<0.54
N-15S	05/18/2012	<1.0	<0.49
N-15S	05/17/2013	<1.0	<0.20
N-15S	05/07/2014	<1.0	<0.20
N-15S	11/16/2015	<1.0	2.5J
N-15D	5/11/2011	<0.25	<0.58
N-15D	5/18/2012	<1.0	<0.46
N-15D	5/17/2013	<1.0	<0.20
N-15D	05/07/2014	<1.0	<0.20
N-15D	11/16/2015	<1.0	<1.5

J – Estimated value
< -Not detected at or above indicated laboratory reporting limit.
- Result exceeds MCL.
NA – No information available.
µg/L microgram per liter

When considering benzene levels in N-5 over the past 20 years, there are several unexplained spikes and a gradual decline in concentration, see Figure 4 below.

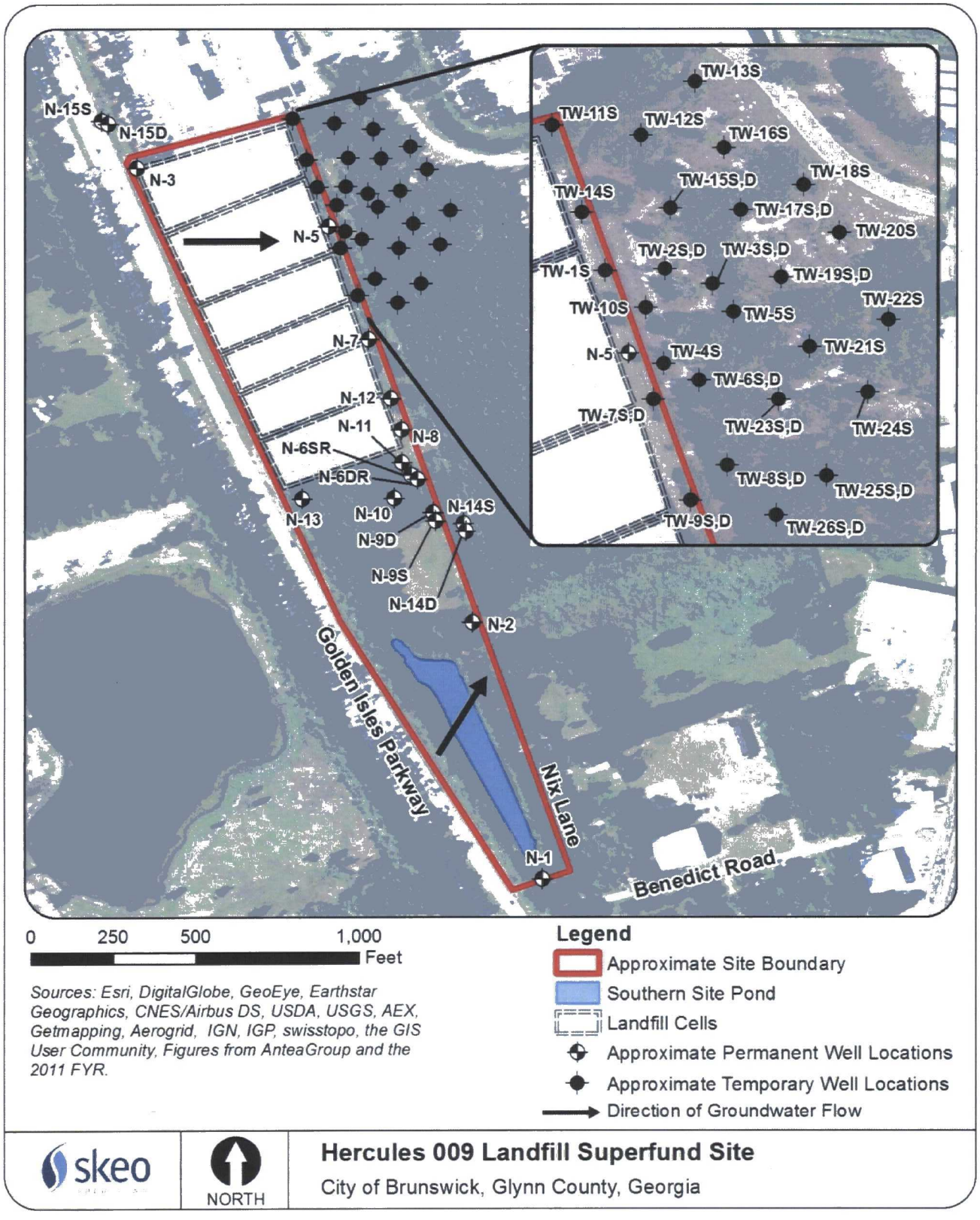
Figure 4: Benzene Contamination in N-5 (1995-2015)



The last time that N-5 benzene concentrations were in compliance with the 5 µg/L MCL was in 2005. The large fluctuations in concentrations make it difficult to predict whether benzene concentrations will be consistently below the MCL in the near future.

All wells upgradient from residential areas (N-12, N-7, N-10 and N-6DR) where municipal water lines were installed show contaminant levels below MCLs. All benzene concentrations were below 1 µg/L.

Figure 5: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

6.5 Site Inspection

The Superfund site inspection was held on October 29, 2015. In attendance were representatives from EPA, RPM Scott Martin; GAEPD, Penny Gaynor; Antea Group (Hercules' O&M contractors), Gary Ribblett and Glenn Hoffmann; and Skeo Solutions (EPA's FYR contractor), Treat Suomi and Sarah Alfano. Participants met at the Site to discuss the current site remedial conditions and also noted new uses at the Site.

Over the past five years, Hercules has partnered with the Wildlife Habitat Council to promote the southern on-site pond as a habitat area. In an effort to attract wildlife and become a certified habitat area, Hercules has positioned basking logs and added cover boards to the pond vicinity and is working with a local college, College of Coastal Georgia, to provide opportunities for educational visits and species tracking. Native reptiles, small mammals and birds have returned to the Site and Hercules is considering adding a wildflower field in an effort to further attract pollinators. The EPA contractors photographed the Site (Appendix E) and filled out the site inspection checklist. Results of the site inspection are available in the complete site inspection checklist in Appendix D.

The landfill area is surrounded by a fence with warning signs in various locations and locked gates to prevent trespassing. A portion of the Site (the area on top of the monolith) is in reuse as a parking lot for the neighboring automobile dealership, and the perimeter of this area has additional fencing. The entrance to the car dealership's lot is monitored and gated at night by the car dealership to prevent trespassing. Hercules' contractors perform a visual site inspection monthly. In addition to the paved part of the monolith being used as a parking lot, there is a well-established vegetative cover over the remaining portions (small portions on southeastern area of the monolith have sparse vegetation). Site inspection participants observed that most parts of the visible monolith were well-vegetated and properly maintained. PRP contractors noted they have not had issues with trespassing.

The monitoring wells were labeled and secured; seven are monitored annually. Site participants noted an old well on the southeast side of the monolith, between N-12 and N-7, was not labeled and should be considered for abandonment.

On October 29, 2015, Skeo Solutions staff visited the designated site repository, Brunswick/Glynn County Regional Library, as part of the site inspection. The site repository contained the full administrative record through 1998 (including the 1998 ESD). The site repository records also included the 2006 FYR report but did not include a copy of the 2011 FYR.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including the current landowners and regulatory agencies involved in Site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. All of the interviews took place during the site inspection on October 29, 2015, or by email after. The interviews are summarized below. Appendix C provides the complete interviews. In addition, a representative from the Glynn Environmental Coalition requested additional information and the EPA site team is following up with the individual.

Glenn R. Hoffman: Glenn R. Hoffman represents the PRP's O&M contractor, The Antea Group, at the Site. Mr. Hoffman confirmed that the remedy in place is doing very well so far. He stated that no more elevated levels of toxaphene have been discovered and that only benzene is above the target level in well N-5, which is steadily decreasing in concentration. He also mentioned that the cover and cap are providing excellent protection. Mr. Hoffman performs regular O&M inspections himself and performs light maintenance as needed. He noted that there have been no changes in O&M requirements, as well as no difficulties or unexpected costs.

Gary Ribblett: Gary Ribblett represents the PRP's O&M contractor, The Antea Group. He commented that there has been a great commitment to maintenance and cleanup at the Site. Mr. Ribblett agreed with Mr. Hoffman in that no recent elevated toxaphene levels have been detected in the groundwater and that only one well is above the remediation goal for benzene. He noted that The Antea Group performs regular O&M inspections with no changes or impacts to the O&M requirements in the past five years. He also noted that there have been no unexpected O&M difficulties or costs and that there has been an opportunity to optimize O&M costs through the opening of an office at the former Brunswick plant to support O&M activities.

Penny Gaynor: Penny Gaynor represents the GAEPD. She stated that the remedy is performing as designed, the cap is in good condition and that a portion of the Site is being reused. She also noted that benzene concentrations in monitoring well N-5 are above the remediation goal and that the plume has migrated off site, stressing that action needs to be taken to define the current extent of it and perform remediation of the off-site plume.

Ms. Gaynor stated there are no complaints from residents and that she is aware of no changes to state laws that could affect the Site. She mentioned that the GAEPD has been in contact with the EPA regarding the Site in the past five years, performing a site visit in April 2014 and sending comments to the EPA in August 2013 regarding the 2012 annual report. She stressed that she is not comfortable with the status of the institutional controls at the Site because an environmental covenant is needed at the Site and institutional controls need to be in place for the off-site benzene plume.

Stephanie Bennett, Becky Stone and Eric Chasteen: Stephanie Bennett, Becky Stone and Eric Chasteen represent the adjacent car dealership, Nalley Automotive Group. The three representatives confirmed that they are aware of the former issues and cleanup activities and that they have no current issues with the Site. The business is happy to take care of maintenance inside the fenced parking area on top of the cap, while being able to use the parking lot. Ms. Bennett, Ms. Stone and Mr. Chasteen commented that the facility is kept very secure due to the amount of cars stored at the dealership and the EPA has kept them informed of site activities.

Glynn Environmental Coalition: A representative of Glynn Environmental Coalition contacted the EPA regarding the Site. The representative stated that there are ongoing problems with BTEX (benzene, toluene, ethylbenzene and xylenes) compounds and that they would like to see the most recent groundwater report. The representative shared concerns about pond biota, site accessibility and the EPA's current sampling methods at the Site. The representative also noted that they were not aware of sampling at the nearby Altama Elementary School by the appropriate analytical method.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The review of documents and the site inspection indicate most remedial components are functioning as intended by the Site's decision documents. Upon visual inspection, the monolith appears to be well-vegetated, well-maintained and is containing the treated materials as intended. The PRP continues to implement O&M activities outlined in the 1993 ROD. Due to lack of access to the adjacent parcel there was no sampling data collected east of N-5 during the last five years. Benzene may be migrating off site and the required institutional controls are not in place. However, there is no pathway of exposure to groundwater since OU2 connected nearby residents to the municipal water supply.

Site stakeholders initiated a pilot study in the area east of N-5 to determine the impact of magnesium sulfate injections on benzene concentration levels and to promote contaminant containment. The adjacent property east of N-5 is not in use so there are no current completed exposure pathways; however, the property may be used in the future.

The remedy requires long-term monitoring of groundwater to ensure that source material has been effectively contained. Toxaphene was not detected above cleanup goals in any of the seven monitoring wells sampled over the past five years. Of the wells sampled, monitoring well N-5 was the only monitoring well that showed concentrations of benzene above the MCL over the past five years. Fluctuations in concentrations at N-5 over the years make it difficult to predict whether benzene concentrations in groundwater will be consistently below the MCL in the near future. The remedy specifies that if it becomes apparent that cleanup levels will not be achieved or if COCs are migrating from their 1993 ROD positions or if contaminant concentrations increase to 50 percent higher than 1993 ROD levels, an alternate remedy (pump-and-treat system) should be implemented. Although there is a general decreasing trend in contamination at the Site and concentrations have not increased to 50 percent higher than the ROD levels, in 2011, groundwater contamination was confirmed off site.

The remedy requires the implementation of institutional controls to limit soil excavation and groundwater use until cleanup goals have been met, but these institutional controls have not yet been implemented. However, the PRP and site owner, Hercules, has owned both parcels since 1974 and continues to work with the EPA and the GAEPD to ensure appropriate on-site use. In addition, the off-site property adjacent to the Site, may have elevated levels of benzene in groundwater and require use restrictions.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

The groundwater cleanup goals established in the 1993 ROD and 1998 ESD, based on federal drinking water standard MCLs for benzene and toxaphene remain valid. There have been no changes to these ARARs since 1993. The Site's RAOs and exposure assumptions remain valid. It has not been necessary to assess the possibility of soil vapor intrusion because the remaining benzene contamination around well N-5 does not appear to be located under any enclosed buildings. A residential risk-based screening-level vapor intrusion evaluation was conducted to determine if this potential exposure pathway would require more in-depth analysis if a building were to be built on site. Recent data to assess the off-site risk were not available. The minimum, maximum and most current concentrations of benzene measured in a permanent well over the past five years was used in the EPA's Vapor Intrusion Screening Level (VISL)

calculator for this screening level risk-based analysis. As shown in Table 10, the maximum concentration of benzene of 710 µg/L was observed in well N-5 in May 2012 while the lowest concentration of 9.2 µg/L was observed in 2014 and then increased to 86 µg/L in 2015. The screening-level analysis indicates that the maximum concentration of benzene observed in 2012 result in potential cancer risks above the EPA's risk management range of 1×10^{-6} to 1×10^{-4} and above the EPA's noncancer threshold HQ of 1.0. However, the risks associated with the lower concentrations observed in 2014 and 2015 in N-5 fell within EPA's risk management range and the noncancer HQs were below 1.0. Further, all other wells sampled were below detection or near detection limits suggesting residual benzene concentrations in groundwater are localized. This information indicates that the vapor intrusion exposure pathway does not currently pose any health concerns. However, due to the observed increase in benzene concentrations in N-5, if any future development were to occur in this area, a vapor intrusion evaluation is recommended to determine if the risks associated with this pathway remain within acceptable limits.

Table 10: Screening-Level Vapor Intrusion Evaluation

COC	BenzeneConcentration Detected in N-5 (µg/L)[a]	2015 VISL Calculator[b] (avg. groundwater temp 25°C)	
		Residential Exposure	
		Cancer Risk	Noncancer HQ
Most current Benzene	86 (November 2015)	5.4×10^{-5}	0.6
Maximum Benzene	710 (May 2012)	4.5×10^{-4}	5.1
Minimum Benzene	9.2 (May 2014)	5.8×10^{-6}	0.07

a. Data obtained from Hercules' contractor sampling spreadsheet.
b. VISL calculator version 3.5 accessed at https://www.epa.gov/sites/production/files/2016-07/visl-calculator_v_350.xlsm (accessed 7/12/2016).

The residential-based soil performance standards established in the 1993 ROD remain valid for toxaphene based on a residential screening level risk evaluation (Table 11) because the ROD cleanup goal equates to a residential cancer risk that is below the lower bound of EPA's risk management range of 1×10^{-6} to 1×10^{-4}. Toxaphene was not the only COC at the Site; the soil remedy focused on this COC based on toxicity, mobility and frequency of detection, and assumed that other COCs would be reduced to acceptable levels when the cleanup level was met for toxaphene. To determine if this assumption is still correct based on current toxicity data since the 1993 ROD was issued, a screening level risk comparison was conducted (Appendix G) to determine if any new COCs should be identified for soil. Based on the additional review, dioxin was identified as a COC only in landfill waste based on residential (unrestricted use) but not surface soil or subsurface soil. The concentrations in landfill waste were below industrial screening levels for dioxin. The screening level analysis supports the need for institutional controls to restrict land use and excavations.

Table 11: Surface Soil Screening Level Risk Evaluation

Soil COC	1993 ROD Surface Soil Remedial Goal (µg/kg)	EPA Residential Regional Screening Level (RSL)[a]		Residential	
		1×10^{-6} Risk	HQ = 1	Risk[b]	Noncancer HQ
Toxaphene	250	490	NA	5.1×10^{-7}	NA

[a] Current RSLs, dated June 2015, are available at http://www.epa.gov/risk/risk-based-screening-table-generic-tables (accessed 1/19/2016).
[b] Cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 1×10^{-6} risk:

Cancer risk = (1993 ROD remedial goal ÷ soil cancer RSL) × 10^{-6}

NA = EPA has not established a non-cancer toxicity value for this compound.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information, other than the information discussed above, has come to light that calls into question the current protectiveness of the remedy. In the future, if the benzene plume is found to extend under enclosed buildings or if use plans change on the adjacent property east of the Site then a vapor intrusion assessment may be necessary.

7.4 Technical Assessment Summary

The review of documents, ARARs and risk assumptions, and the site inspection indicate the selected remedies are currently protective and are functioning as intended by the RODs, ESD and the EPA-approved work plan for well installation and monitoring. The monolith appears to be well-vegetated, well-maintained and containing the treated materials as intended. Toxaphene was not detected above the MCL in any of the seven permanent sampling wells over the past five years; N-5 was the only groundwater monitoring well that showed concentrations of benzene above the MCL. Monitoring results in N-5 have varied greatly over time, but the general trend shown over the past five years is a reduction in benzene concentrations. The concentration fluctuations make it difficult to predict whether benzene concentrations in groundwater will be consistently below the MCL at all site wells in the near future. Temporary wells were installed, then removed and closed adjacent to the Site and east of N-5 (in the direction of groundwater flow) to assess the extent of benzene migration. Currently, neither Hercules nor the EPA has approval to access the adjacent property. This adjacent property is not in use so there are no current completed exposure pathways; however, it may be used in the future.

The remedy requires the implementation of institutional controls to limit land use and soil excavation and groundwater use until cleanup goals have been met, but these controls have not yet been implemented.

The groundwater cleanup goals established in the 1993 ROD and 1998 ESD, based on federal drinking water standard MCLs for benzene and toxaphene remain valid. RAOs and exposure assumptions remain valid. The soil performance standards established in the 1993 ROD remain valid.

8.0 Issues, Recommendations and Follow-up Actions

Table 12: Issues and Recommendations Identified in the Five-Year Review

OU1	**Issue Category: Remedy Performance**			
	Issue: Benzene levels continue to exceed MCLs at monitoring well N-5.			
	Recommendation: Collect data downgradient of N-5 to refine the extent of groundwater contamination.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	1/31/2017

OU1	**Issue Category: Institutional Controls**			
	Issue: Institutional controls to restrict land use and groundwater use until cleanup levels are achieved are not in place.			
	Recommendation: Site stakeholders should finalize and implement institutional controls that restrict land use and groundwater use until cleanup goals are met.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	1/31/2017

The following additional items, though not expected to affect protectiveness, warrant additional follow-up:

- Current fluctuating benzene levels in N-5 could pose a vapor intrusion risk if a building were to be placed in the immediate vicinity of the well. The EPA should consider whether institutional controls are needed on site, and potentially off site.
- The EPA and Hercules should work with the owner of the property to the east of the Site in order to secure consistent and ongoing access agreements especially if the property will be used in the future.
- There is an active community group interested in the Site's status. The EPA should update the site repository with the 2011 FYR.
- An old well on the southeast side of the monolith, between N-12 and N-7, was not labeled and should be considered for abandonment.
- The O&M plan has not been updated since the pavement of the monolith for use as a parking lot. The EPA and Hercules should review the O&M plan and update if necessary.

9.0 Protectiveness Statements

Table 13: Protectiveness Statements

Protectiveness Statements	
Operable Unit:	*Protectiveness Determination:*
1	Short-Term Protective
Protectiveness Statement:	
The remedy for OU1 currently protects human health and the environment because contaminated source material and soil contamination have been excavated, stabilized and contained on the Site within a monolith, and there are no current exposures to contaminated groundwater. In order for the OU1 remedy to be protective in the long term, institutional controls should be implemented, data downgradient of monitoring well N-5 should be collected and assessed.	

Operable Unit:	*Protectiveness Determination:*
2	Protective
Protectiveness Statement:	
The interim remedy for OU2 is protective of human health and the environment because municipal water lines from the Brunswick water system were extended to well users in the area and samples from monitoring wells upgradient of the residential area meet the Safe Drinking Water Act Standards.	

Sitewide Protectiveness Statement
Protectiveness Determination: Short-Term Protective
Protectiveness Statement: *Because the remedial actions at all OUs are protective in the short term, the Site's remedy is protective of human health and the environment in the short term. In order for the remedy to be protective in the long term, institutional controls should be implemented, data downgradient of monitoring well N-5 should be collected and assessed.*

10.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

2010 Annual Groundwater Monitoring and Inspection Report, Antea Group for Hercules 009 Landfill Site, Brunswick, Glynn County Georgia.

Administrative Order on Consent, Hercules 009 Landfill Site, Glynn County, Georgia, EPA, Atlanta, GA. July 1988.

Amended Groundwater Assessment Plan, Brunswick, Glynn County, Georgia, prepared for Hercules by Antea Group, January 2011.

EPA Superfund Program: Hercules 009 Landfill, Brunswick, GA. Accessed from website http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0401699 January 2016.

EPA Record of Decision: Hercules 009 Landfill EPA ID: GAD980556906 OU1. Prepared by EPA Region 4. March 25, 1993.

Explanation of Significant Differences, Hercules 009 Landfill Site, Operable Unit One, Brunswick, Glynn County, Georgia, EPA, Atlanta, GA. August 1998.

Final Remedial Design Report, Hercules 009 Landfill Site, Brunswick, Georgia, RMT, Inc., Greenville, South Carolina, February 1998.

Final Report for the Hercules 009 Off-Site Excavation in Brunswick, Georgia, OHM Remediation Services Corp, Norcross, Georgia, 12 July 1995.

Glynn Environmental Coalition (GEC). Accessed from website http://www.glynnenvironmental.org/ January 2016.

Interim Action Record of Decision, Hercules 009 Landfill Site, Brunswick, Glynn County, Georgia, EPA, Atlanta, GA. June 1991.

More Information Is Needed On Toxaphene Degradation Products, Office of Inspector General, Ombudsman Report, December 2005.

Preliminary Remedial Design Report, Hercules 009 Landfill Site, Brunswick, Georgia, RMT, Inc., Greenville, South Carolina, January 1997.

Oversight Plan, Hercules 009 Landfill Site, Brunswick, Glynn County, Georgia, December 1989.

Record of Decision Summary of Remedial Alternative Selection, Operable Unit One, Brunswick, Glynn County, Georgia, EPA, Atlanta, GA. June 1991.

Remedial Action Construction Completion Report, Hercules 009 Landfill Site, Brunswick, Georgia, RMT, Inc., Greenville, South Carolina, May 1999.

Remedial Action Performance Standards Verification Plan, Hercules 009 Landfill Site, Brunswick, Glynn County Georgia, RMT, Inc., Greenville, South Carolina, January 1998.

Remedial Action Workplan Hercules 009 Landfill NPL Site, Brunswick, Glynn County Georgia, RMT, Inc., Greenville, South Carolina, January 1998.

Remedial Investigation/Feasibility Study Work Plan, Hercules 009 Landfill, Brunswick, Georgia, October 1998.

Second Five-Year Review Report, Hercules 009 Landfill Site, Brunswick, Glynn County, Georgia.

Toxaphene 8001-35, -2, EPA profile accessed from website http://www3.epa.gov/airtoxics/hlthef/toxaphen.html January 2016.

Toxic Waste Heading For Private Wells, Atlanta Journal, Davis, Jingle, Brunswick Georgia, May 16, 1991.

Appendix B: Press Notice

The U. S. Environmental Protection Agency, Region 4
Announces the Fourth Five-Year Review
for the Hercules 009 Landfill Superfund Site,
Brunswick, Glynn County, Georgia

Purpose/Objective: The U.S. Environmental Protection Agency (EPA) is conducting a Five-Year Review of the remedy for the Hercules 009 Landfill Superfund site (the Site) in Brunswick, Georgia. The purpose of the Five-Year Review is to make sure the selected cleanup actions effectively protect human health and the environment.

Site Background: The 16.5-acre area is a former industrial landfill. From 1948 to 1980, the Hercules Corporation (Hercules) manufactured toxaphene, an agricultural pesticide used to control boll weevils, ticks and mites on cattle. Under a state permit, Hercules disposed of wastewater sludge from the production of toxaphene in the 009 Landfill. Toxaphene product drums and toxaphene-contaminated glassware, rubble and trash were also disposed of in the landfill. Waste disposal practices resulted in the contamination of soils, sediments and groundwater. In 1980, Hercules' waste disposal permit was canceled and the State of Georgia ordered the landfill's closure. EPA finalized the Site on the Superfund program's National Priorities List (NPL) in September 1984. Contaminants of concern at the Site include volatile organic compounds, including benzene, trichloroethylene, toluene and xylenes, other organic contaminants, including dioxin and pesticides, and metals, including arsenic, chromium and lead.

Cleanup Actions: EPA designated two operable units (OUs) to address contaminated on-site soils, sediments and groundwater. EPA selected the remedy for OU1 – on-site soils and sediments – in March 1993. The remedy included removal and treatment of contaminated soils and sludge. Materials with high toxaphene concentrations were added to landfill cells, treated and then covered with cement and treated soil.

EPA selected the remedy for OU2 – groundwater – in June 1991. The remedy included the connection of seven institutional and residential locations to the City of Brunswick's public water supply system. The remedy also required institutional controls to restrict land uses and site access. Post-construction groundwater monitoring is ongoing.

Five-Year Review Schedule: The National Contingency Plan requires review of remedial actions resulting in any hazardous substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure every five years to ensure the protection of human health and the environment. The fourth of the Five-Year Reviews for the Site will be completed by July 6, 2016.

EPA invites community participation in the Five-Year Review process: EPA is conducting this Five-Year Review to evaluate the effectiveness of the Site's remedy and to ensure that the remedy remains protective of human health and the environment. As part of the process, EPA staff members are available to answer any questions about the Site. Community members who have questions about the Site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Scott Martin, Remedial Project Manager
Phone: 404-562-8916
E-mail: martin.scott@epa.gov

Angela Miller, Community Involvement Coordinator
Phone: 404-562-8561
E-mail: miller.angela@epa.gov

Mailing Address: U.S. EPA Region 4, 61 Forsyth Street, S.W., Atlanta, GA 30303-8960

Additional site information is available at the Site's document repository, located at Glynn County Public Library, 208 Gloucester Street, Brunswick, Georgia 31520, and online at http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0401699.

Appendix C: Interview Forms

Hercules 009 Landfill Superfund Site **Five-Year Review Interview Form**

Site Name: Hercules 009 Landfill **EPA ID No.:** GAD980556906
Interviewer Name: _____
Subject Name: Glenn R. Hoffmann **Affiliation:** Antea Group
Subject Contact Information: glenn.hoffmann@anteagroup.com
Time: 1:30 pm **Date:** Nov. 2, 2015
Interview Location: Office
Interview Format (circle one): In Person Phone byMail Other:

Interview Category: O&M Contractor

1. **What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?** Great cleanup, environmental protection and reuse activity (Car Dealership).

2. **What is your assessment of the current performance of the remedy in place at the Site?** Doing very well so far. No more toxaphene discovered. Benzene above target only in well N-5. This is being investigated. Cover and cap providing excellent protection.

3. **What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site.** No toxaphene is being found. Benzene above target in only one well. Dissipating.

4. **Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.** I currently perform regular O&M inspections and perform light maintenance as required. Secure contractor help as needed.

5. **Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.** No changes in the last 5 years. No site impacts.

6. **Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.** No unexpected difficulties or costs.

7. **Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.** Antea Group personnel are already located permanently in town and can deploy easily and rapidly to incidents or issues.

8. **Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?** Current O & M and sampling has gone quite well over the last 5 years.

Hercules 009 Landfill Superfund Site **Five-Year Review Interview Form**

Site Name: Hercules 009 Landfill **EPA ID No.:** GAD980556906
Interviewer Name: _____ **Affiliation:** _____
Subject Name: Gary Ribblett **Affiliation:** Antea Group
Subject Contact Information: gary.ribblett@anteagroup.com
Time: 10:00 am **Date:** Nov. 5, 2015
Interview Location: In person onsite and Office
Interview Format (circle one): In Person Phone Mail Other: email
Interview Category: O&M Contractor

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)? Great commitment to maintenance & cleanup; Excellent reuse/redevelopment with auto dealership and wildlife restoration efforts.

2. What is your assessment of the current performance of the remedy in place at the Site? Excellent. No toxaphene detected in groundwater, only one well with remaining benzene above target, and that decreasing.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site? Benzene in N-5 only compound and location above target of 5 ug/L. Has been decreasing.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence. Currently regular O&M inspections by Antea Group for Hercules, documented at Antea Group office in Brunswick.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts. No changes or impacts in past 5 years.

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details. No unexpected O&M difficulties or costs.

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies. Antea Group, in cooperation with Hercules, has established an office at the former Brunswick plant (now Pinova), and supports O&M/sampling activities from a Jacksonville, FL office, which provides significant advantages in cost and convenience/response time.

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site? None. Process appears to be working well and efficiently.

Hercules 009 Landfill Superfund Site **Five-Year Review Interview Form**

Site Name:	Hercules 009 Landfill	**EPA ID No.:**	GAD980556906
Interviewer Name:	Sarah Alfano	**Affiliation:**	Skeo Solutions
Subject Name:	Penny Gaynor	**Affiliation:**	GA EPD
Subject Contact Information:	Penny.gaynor@dnr.ga.gov		
Time:	9:00 am	**Date:**	November 10, 2015
Interview Location:	Office		

Interview Format (circle one): In Person Phone Mail Other:

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?
   The remedy is performing as designed and the cap is in good condition. A portion of the property is currently being reused. The only cleanup remaining is the benzene plume in the vicinity of monitoring well N-5 that has moved offsite.
2. What is your assessment of the current performance of the remedy in place at the Site?
   The cap is in good condition and performing as designed. However, benzene concentrations in monitoring well N-5 remain above the remediation goal and the plume has migrated offsite. Action needs to be taken to define the current extent of the plume and perform remediation.
3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?
   No
4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.
   Yes, in August 2013 comments were sent to EPA regarding the 2012 annual report. In addition, a site visit was performed in April 2014 – no problems were noted. EPD has not received the 2013 or 2014 annual reports for the site.
5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?
   No
6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?
   No, an environmental covenant has not been put in place on the Hercules property and there are no institutional controls in place for the offsite benzene plume.
7. Are you aware of any changes in projected land use(s) at the Site?
   No
8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?
   Hercules needs to address the offsite benzene plume, which had concentrations above the MCL back in 2011. There is no current data regarding concentrations in the offsite plume.

Hercules 009 Landfill Superfund Site **Five-Year Review Interview Form**

Site Name:	**Hercules 009 Landfill**	**EPA ID No.:**	**GAD980556906**
Interviewer Name:	**Treat Suomi**	**Affiliation:**	**Skeo Solutions**
Subject Name:	**Stephanie Bennet, Becky Stone and Eric Chasteen**	**Affiliation:**	**Nalley Automotive Group**
Subject Contact Information:	**912-267-7000**		
Time:	**9:50 a.m.**	**Date:**	**10/29/2015**
Interview Location:	**Nalley Dealership, Brunswick, Georgia**		

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:**

Interview Category: **Local Business Owner**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?
   Yes.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?
   There are no issues, the arrangement works well for us. Everything is fine. The dealership takes care of maintenance inside the fenced parking area on top of the cap. There haven't been any issues in the last five years.

3. What have been the effects of this Site on the surrounding community, if any?
   Just the boon to us being able to use the parking lot.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?
   No. The facility is very secure because of the cars stored at the site for the dealership.

5. Has EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can EPA best provide site-related information in the future?
   Yes, we work with Glenn to stay connected.

6. Do you own a private well in addition to or instead of accessing city/municipal water supplies? If so, for what purpose(s) is your private well used?
   No, the dealership is on municipal water.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?
   No.

Hercules 009 Landfill Superfund Site Five-Year Review Interview Form

Site Name:	**Hercules 009 Landfill**	**EPA ID No.:**	**GAD980556906**
Subject Name:		**Affiliation:**	**Glynn Environmental Coalition**
Time:	**3:20pm**	**Date:**	**2/15/2016**

Interview Format (circle one): In Person Phone Mail Other: Email

Interview Category: Residents

8. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

There are some ongoing problems with BTEX compounds in groundwater at the Hercules 009 Landfill Superfund Site and we do not know if we have the most recent groundwater report. We also notice gates open and have other concerns about the biota in the on-site pond.

An email from the GA-EPD to the EPA discussed avoiding sampling by the analytical method approved by the EPA for toxaphene after the EPA Office of Inspector General looked at the Site and produced two reports (One recommending appropriate sampling methods, which the EPA did develop).

9. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

It would be helpful for the FYR to explain why the EPA is wanting to avoid sampling by an appropriate method. We do not know of any sampling of the adjoining Altama Elementary School by the appropriate analytical method. In other words, it remains unknown what levels of chemicals remain on the elementary school property.

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site name: Hercules 009 Landfill	**Date of inspection: 10/29/2015**
Location and Region: Brunswick, Georgia, Region 4	**EPA ID: GAD980556906**
Agency, office, or company leading the five-year review: EPA	**Weather/temperature: Lower 70's partly sunny**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager**	Glenn Hoffmann	Antea Project Manager	11/05/2015
	Name	Title	Date

Interviewed ☐ at site ☒ By email ☐ by phone by email. _____

Problems, suggestions; ☒ Report attached see Appendix C

2. **O&M staff**	Gary Ribblett	Antea Project Manager	11/05/2015
	Name	Title	Date

Interviewed ☐ at site ☐ at office ☐ by phone by email _____

Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.). Fill in all that apply.

Agency GA Department of Natural Resources

Contact	Penny Gaynor	_____	11/10/2015	_____
	Name	Title	Date	Phone No.

Problems; suggestions; ☒ Report attached see Appendix C

Agency Local Business: Nalley Automotive Group

Contact	_____	General Manager	10/29/2015	(912) 267-7000
	Name	Title	ate	Phone No.

Problems; suggestions; ☒ Report attached see Appendix C

4. **Other interviews** (optional) ☐ Report attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☐ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☐ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. **Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: _____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐ Up to date ☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State

☐ PRP in-house ☒ Contractor for PRP

☐ Federal Facility in-house ☐ Contractor for Federal Facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate $104,000 per year ☐ Breakdown attached

Total annual cost by year for review period if available

From 01/01/2011 Date	To 12/31/2011 Date	$ Total cost	☐ Breakdown attached
From 01/01/2012 Date	To 12/31/2012 Date	$ Total cost	☐ Breakdown attached
From 01/01/2013 Date	To 12/31/2013 Date	$ Total cost	☐ Breakdown attached
From 01/01/2014 Date	To 12/31/2014 Date	$ Total cost	☐ Breakdown attached
From 01/01/2015 Date	To 12/31/2015 Date	$ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☒ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☒ Yes ☐ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by) _____

Frequency _____

Responsible party/agency Hercules, Inc.

Contact	_____	_____	//_____	_____
	Name	Title	Date	Phone no.

Reporting is up-to-date	☐ Yes	☒ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☒ No	☐ N/A
Violations have been reported	☐ Yes	☐ No	☒ N/A

Other problems or suggestions: ☒ Report attached

See Section 6.3 of the current report. Institutional controls are needed but are not yet in place.

2. **Adequacy** ☐ ICs are adequate ☒ ICs are inadequate ☐ N/A

Remarks: _____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land use changes on site** ☒ N/A

Remarks: _____

3. **Land use changes off site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Arial extent _____ Depth _____
Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths _____ Widths _____ Depths _____
Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Arial extent _____ Depth _____
Remarks: _____

4. **Holes** ☐ location shown on site map ☒ Holes not evident
Arial extent _____ Depth _____
Remarks: _____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established
☒ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: _____

6. **Alternative Cover** (armored rock, concrete, etc.) ☐ N/A
Remarks: Pavement acting as a parking lot at the top of the landfill is intact.

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Arial extent _____ Height _____
Remarks: _____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Arial extent _____
☐ Ponding ☐ Location shown on site map Arial extent _____
☐ Seeps ☐ Location shown on site map Arial extent _____
☐ Soft subgrade ☐ Location shown on site map Arial extent _____
Remarks: _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map
☒ No evidence of slope instability
Arial extent _____
Remarks: _____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay Remarks: _____	
2. **Bench Breached** ☐ Location shown on site map ☐ N/A or ok y Remarks: _____	
3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay Remarks: _____	
C. Letdown Channels ☒ Applicable ☐ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)	
1. **Settlement** (Low spots) ☐ Location shown on site map ☒ No evidence of settlement Arial extent _____ Depth _____ Remarks: _____	
2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation Material type_____ Arial extent _____ Remarks: _____	
3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion Arial extent _____ Depth _____ Remarks: _____	
4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting Arial extent _____ Depth _____ Remarks: _____	
5. **Obstructions** Type _____ ☒ No obstructions ☐ Location shown on site map Arial extent _____ Size _____ Remarks: _____	
6. **Excessive Vegetative Growth** Type _____ ☒ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Arial extent _____ Remarks: _____	
D. Cover Penetrations ☐ Applicable ☒ N/A	
E. Gas Collection and Treatment ☐ Applicable ☒ N/A	
2. **Gas Collection Wells, Manifolds and Piping** ☐ Good condition ☐ Needs Maintenance Remarks: _____	
F. Cover Drainage Layer ☒ Applicable ☐ N/A	

1. **Outlet Pipes Inspected** ☒ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Area extent _____ Depth _____ ☒ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent _____ Depth _____

☒ Erosion not evident

Remarks: _____

3. **Outlet Works** ☒ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☒ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement _____ Vertical displacement _____

Rotational displacement _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent _____ Depth _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent _____ Type _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent _____ Depth _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent _____ Depth _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring _____

☐ Performance not monitored

Frequency _____ ☐ Evidence of breaching

Head differential _____

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☒ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**

☐ Good condition ☐ Needs Maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring data suggests:**

☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy called for containment of contamination within a covered landfill after treating the soil with in-situ stabilization. Institutional controls are required to restrict monolith excavation and to restrict groundwater use until MCLs are met.The groundwater monitoring system helps monitor contamination levels but contamination may be migrating off site. Institutional controls have not been implemented though Hercules has owned the site property since the remedial action and has worked with the EPA to use the Site appropriately.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The O&M for the Site was designed to monitor the continued containment of any remaining contamination. The capped landfill remains in good condition; it is kept mowed and inspected regularly. However, groundwater monitoring indicates that benzene may be migrating off site to the east in the direction of groundwater flow.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

Limited monitoring results from the on-site permanent wells during the last five year indicate that benzene may be migrating off site to the east, in the direction of groundwater flow. Additional monitoring may be required to determine the extent of off-site migration.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

_____

Appendix E: Photographs from Site Inspection Visit

Approaching the Site from the southern entrance.

Monitoring Well N-6SR and N-6DR.

Small area of sparse vegetative cover on southern slope of the monolith, surrounded by fencing.

Pilot study area east of monitoring well N-5.

Groundwater monitoring well N-5.

Dealership parking lot on top of the monolith.

Site field south of the monolith.

On-site southern pond habitat area.

Appendix G: Risk Evaluation of All Soil and Landfill Waste COCs

To determine if toxicity value changes since the 1993 ROD was issued would result in the identification of additional soil COCs, the maximum concentration detected in soil or landfill waste was evaluated for the 26 COCs detected in these media. As shown in Table G-1 the only new COC would be dioxin as the noncancer hazard quotient (HQ) exceeds 1.0 based on the most current toxicity values for this compound.

Table G-1: Risk Evaluation of Maximum Detections in Soil or Landfill Waste

Contaminant	Maximum Detection[a] (mg/kg)	Residential RSL[b] Cancer Risk 1×10^{-6}	Residential RSL[b] Noncancer HQ=1	Residential Evaluation of Maximum Detection[c] Risk	Residential Evaluation of Maximum Detection[c] HQ
Arsenic	1.0	0.68	35	1.5E-06	0.03
Beryllium	0.3	1600	160	1.8E-10	0.0018
Cadmium	3.6	2100	71	1.7E-09	0.05
Chromium (III)	30.9	--	120000	--	0.0003
Copper	73.9	--	3100	--	0.02
Lead	238	--	400	--	0.60
Manganese	1740	--	--	--	
Mercury	0.26	--	11	--	0.02
Nickel	24.0	15000	670	1.6E-09	0.04
Vanadium	33.3	--	390	--	0.09
Zinc	273	--	23000	--	0.01
Acetone	0.43	--	61000	--	0.00001
Bis(2-ethyhexyl)phthalate	0.63	39	1300	1.6E-08	0.0005
Benzene	0.01	112	82	9.8E-11	0.0001
Carbon Tetrachloride	ND	0.65	100	--	--
Chlorobenzene	0.01	--	280	--	0.0001
Chloroform	ND	0.32	200	--	--
Ethylbenzene	0.46	5.8	3400	7.9E-08	0.0001
Methylene Chloride	0.026	57	350	4.6E-10	0.0001
Toluene	0.025	--	4900		0.0000
Trichloroethylene (TCE)	0.01	0.94	4.1	1.1E-08	0.0024
Xylenes (total)	4.4	--	580	--	0.01
Alpha-BHC	ND	0.086	510	--	--
Endosulfan II	0.022	--	470	--	0.00005
Toxaphene	4900.0	0.49	--	**1.0E-02**	--
Dioxin/furan (TEQ)	0.00039	0.0000048	0.00005	8.1E-05	**7.6**

a. The maximum observed site contaminant concentration in surface and subsurface soils as presented in Table 6-4 of the 1993 ROD.

b. EPA's 2016 Residential Screening Levels (RSLs) based on cancer risk of 1×10^{-6} and noncancer HQ of 1.0; obtained at http://www.epa.gov/risk/risk-based-screening-table-generic-tables (accessed January 21, 2016).

a. Risk = (maximum detection/risk-based RSL) x 10^{-6}
Noncancer Hazard Quotient (HQ) = (maximum detection/noncancer-based RSL)

1×10^{-6} is equal to 1E-06

ND - contaminant was below detection.

-- no toxicity value established by the EPA, therefore a risk or noncancer HQ could not be calculated

Bold – cancer risk exceeds 1×10^{-4} or HQ exceeds 1.0.

An additional evaluation was also conducted to determine if the maximum dioxin concentration as expressed as total dioxin equivalent concentrations (TEQ) in the 1993 ROD has changed due to revisions to the toxicity equivalency factors (TEFs) that EPA uses to convert the different dioxin congeners into equivalent concentrations of 2,3,7,8-tetrachlorodibenzo-p-dioxin (dioxin). The TEFs used in the 1993 were based on values established in 1989; however, the World Health Organization adopted revised TEFs in 2005, which lowers the relative toxicity of some of the dioxin compounds. Using the revised TEFs, the maximum concentration reported in Table G-1 above (from landfill waste sample SB27) of 0.000390 mg/kg (or 390 parts per trillion) lowers to 0.000350 (or 350 ppt) (Table G-2). Dividing this concentration by the noncancer-based residential RSL results in a future residential noncancer HQ of 7. Under a more realistic industrial exposure the dioxin concentration is below the industrial noncancer RSL of 720 ppt which supports the need for institutional controls since dioxin exceeds levels associated with UU/UE. The maximum dioxin concentration detected in surface soil was 3.3 ppt (in SS24), which when calculated using the more current TEFs, still remains at a level of 3.3 ppt (Table G-3), indicating that dioxin in surface soils remain protective. The maximum subsurface soil concentration contained even lower concentrations <0.08 ppt, thus the subsurface soil is well below the noncancer-based residential RSL of 51 ppt.

G-2: Dioxin Risk Evaluation of Landfill Waste Sample SB27

Dioxin Congener	EPA TEF 1989	EPA TEF-2005	SB27 (ppt)	Old TEQ (ppt)	Current TEQ (ppt)
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	1	1	18.8	18.8	18.800
Pentachlorodibenzo-p-dioxin, 1,2,3,7,8-	0.5	1	8	4	8.000
Hexachlorodibenzo-p-dioxin, 1,2,3,4,7,8-	0.1	0.1	12.9	1.29	1.290
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	0.1	0.1	100	10	10.000
Hexachlorodibenzo-p-dioxin, 1,2,3,7,8,9-	0.1	0.1	43.7	4.37	4.370
Heptachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8-	0.01	0.01	273	2.73	2.730
Heptachlorodibenzo-p-dioxin, 1,2,3,4,7,8,9-	0.01	0.01		0	0.000
Octachlorodibenzo-p-dioxin	0.001	0.0003	581	0.581	0.174
Tetrachlorodibenzofuran, 2,3,7,8-	0.1	0.1	2080	208	208.000
Pentachlorodibenzofuran, 1,2,3,7,8-	0.05	0.03	253	12.65	7.590
Pentachlorodibenzofuran, 2,3,4,7,8-	0.5	0.3	189	94.5	56.700
Hexachlorodibenzofuran, 1,2,3,4,7,8-	0.1	0.1	151	15.1	15.100
Hexachlorodibenzofuran, 1,2,3,6,7,8-	0.1	0.1	45.9	4.59	4.590
Hexachlorodibenzofuran, 1,2,3,7,8,9-	0.1	0.1	21.6	2.16	2.160
Hexachlorodibenzofuran, 2,3,4,6,7,8-	0.1	0.1	78	7.8	7.800
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	0.01	0.01	87.2	0.872	0.872
Heptachlorodibenzofuran, 1,2,3,4,7,8,9-	0.01	0.01	38.3	0.383	0.383
Octachlorodibenzofuran	0.001	0.0003	130	0.13	0.039
				387.956	348.598
			Residential noncancer RSL	51 ppt	

G-3: Dioxin Risk Evaluation of Surface Soil Sample SS24

Dioxin Congener	EPA TEF 1989	EPA TEF-2005	SS24 (ppt)	Old TEQ (ppt)	Current TEQ (ppt)
Tetrachlorodibenzo-p-dioxin, 2,3,7,8-	1	1	0	0	0.000
Pentachlorodibenzo-p-dioxin, 1,2,3,7,8-	0.5	1	0.86	0.43	0.860
Hexachlorodibenzo-p-dioxin, 1,2,3,4,7,8-	0.1	0.1	2	0.2	0.200
Hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-	0.1	0.1	1.6	0.16	0.160
Hexachlorodibenzo-p-dioxin, 1,2,3,7,8,9-	0.1	0.1	2.3	0.23	0.230
Heptachlorodibenzo-p-dioxin, 1,2,3,4,6,7,8-	0.01	0.01	23.8	0.238	0.238
Heptachlorodibenzo-p-dioxin, 1,2,3,4,7,8,9-	0.01	0.01		0	0.000
Octachlorodibenzo-p-dioxin	0.001	0.0003	152	0.152	0.046
Tetrachlorodibenzofuran, 2,3,7,8-	0.1	0.1	4.2	0.42	0.420
Pentachlorodibenzofuran, 1,2,3,7,8-	0.05	0.03	1.5	0.075	0.045
Pentachlorodibenzofuran, 2,3,4,7,8-	0.5	0.3	1.3	0.65	0.390
Hexachlorodibenzofuran, 1,2,3,4,7,8-	0.1	0.1	2.7	0.27	0.270
Hexachlorodibenzofuran, 1,2,3,6,7,8-	0.1	0.1	0.88	0.088	0.088
Hexachlorodibenzofuran, 1,2,3,7,8,9-	0.1	0.1	1.1	0.11	0.110
Hexachlorodibenzofuran, 2,3,4,6,7,8-	0.1	0.1	2	0.2	0.200
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	0.01	0.01	7.1	0.071	0.071
Heptachlorodibenzofuran, 1,2,3,4,7,8,9-	0.01	0.01	0	0	0.000
Octachlorodibenzofuran	0.001	0.0003	10.7	0.0107	0.003
				3.3047	3.331
			Residential noncancer RSL	51 ppt	

Appendix H: 2011 Temporary Well Data

Figure H-1: Benzene in Shallow Groundwater

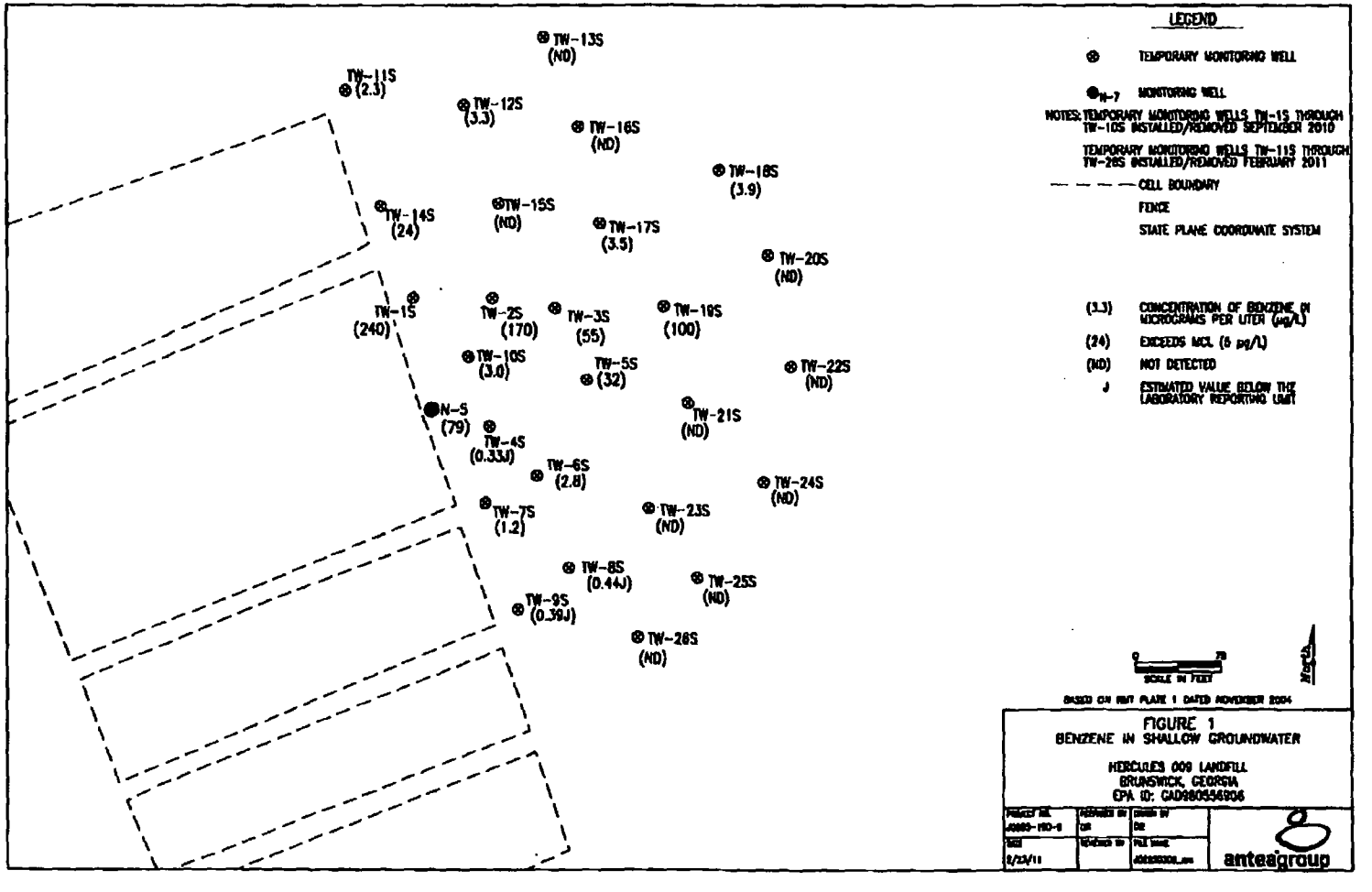


Figure H-2: Benzene in Deep Groundwater